

## SEQUENCE LISTING

<110> Bayerische Julius-Maximilians-Universität Würzburg

<120> Mutein of a bone morphogenetic protein and use thereof

<130> S 10019 PCT

<160> 33

<170> PatentIn version 3.1

<210> 1

<211> 114

<212> PRT

<213> Homo sapiens

<220>

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<222> (1) .. (114)

<223> BMP-2

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His Pro Leu Tyr Val Asp Phe Ser Asp Val Gly Trp Asn Asp Trp Ile  
 20 25 30

Val Ala Pro Pro Gly Tyr His Ala Phe Tyr Cys His Gly Glu Cys Pro  
 35 40 45

Phe Pro Leu Ala Asp His Leu Asn Ser Thr Asn His Ala Ile Val Gln  
 50 55 60

Thr Leu Val Asn Ser Val Asn Ser Lys Ile Pro Lys Ala Cys Cys Val  
 65 70 75 80

Pro Thr Glu Leu Ser Ala Ile Ser Met Leu Tyr Leu Asp Glu Asn Glu  
 85 90 95

Lys Val Val Leu Lys Asn Tyr Gln Asp Met Val Val Glu Gly Cys Gly  
 100 105 110

Cys Arg

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ttttactgcc acggagaatg cccttttcct ctggctgac atctgaactc cactaatcat 180  
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1 5 10 15

Arg Arg His Ser Leu Tyr Val Asp Phe Ser Asp Val Gly Trp Asn Asp  
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Trp Ile Val Ala Pro Pro Gly Tyr Gln Ala Phe Tyr Cys His Gly Asp  
35 40 45

Cys Pro Phe Pro Leu Ala Asp His Leu Asn Ser Thr Asn His Ala Ile  
50 55 60

Val Gln Thr Leu Val Asn Ser Val Asn Ser Ser Ile Pro Lys Ala Cys  
65 70 75 80

Cys Val Pro Thr Glu Leu Ser Ala Ile Ser Met Leu Tyr Leu Asp Glu  
85 90 95

Tyr Asp Lys Val Val Leu Lys Asn Tyr Gln Glu Met Val Val Glu Gly  
100 105 110

Cys Gly Cys Arg  
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caggccttct actgccatgg ggactgcccc ttccactgg ctgaccacct caactcaacc 180  
aaccatgccca ttgtgcagac cctgggtcaat tctgtcaatt ccagtatccc caaagcctgt 240  
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Asn Gln Asn Arg Asn Lys Ser Ser Ser His Gln Asp Ser Ser Arg Met  
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Ser Ser Val Gly Asp Tyr Asn Thr Ser Glu Gln Lys Gln Ala Cys Lys  
20 25 30

Lys His Glu Leu Tyr Val Ser Phe Arg Asp Leu Gly Trp Gln Asp Trp  
35 40 45

Ile Ile Ala Pro Glu Gly Tyr Ala Ala Phe Tyr Cys Asp Gly Glu Cys  
50 55 60

Ser Phe Pro Leu Asn Ala His Met Asn Ala Thr Asn His Ala Ile Val  
65 70 75 80

Gln Thr Leu Val His Leu Met Phe Pro Asp His Val Pro Lys Pro Cys  
85 90 95

Cys Ala Pro Thr Lys Leu Asn Ala Ile Ser Val Leu Tyr Phe Asp Asp  
                   100                  105                  110

Ser Ser Asn Val Ile Leu Lys Lys Tyr Arg Asn Met Val Val Arg Ser  
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Cys Gly Cys His  
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Gln Gln Ser Arg Asn Arg Ser Thr Gln Ser Gln Asp Val Ala Arg Val  
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Ser Ser Ala Ser Asp Tyr Asn Ser Ser Glu Leu Lys Thr Ala Cys Arg  
           20                  25                  30

Lys His Glu Leu Tyr Val Ser Phe Gln Asp Leu Gly Trp Gln Asp Trp  
       35                  40                  45

Ile Ile Ala Pro Lys Gly Tyr Ala Ala Asn Tyr Cys Asp Gly Glu Cys  
 50 55 60

Ser Phe Pro Leu Asn Ala His Met Asn Ala Thr Asn His Ala Ile Val  
 65 70 75 80

Gln Thr Leu Val His Leu Met Asn Pro Glu Tyr Val Pro Lys Pro Cys  
 85 90 95

Cys Ala Pro Thr Lys Leu Asn Ala Ile Ser Val Leu Tyr Phe Asp Asp  
 100 105 110

Asn Ser Asn Val Ile Leu Lys Lys Tyr Arg Asn Met Val Val Arg Ala  
 115 120 125

Cys Gly Cys His  
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 gatggagaat gtccttccc actcaacgca cacatgaatg caaccaacca cgcgattgtg 240  
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 aagctaaatg ccatctcggg tctttacttt gatgacaact ccaatgtcat tctgaaaaaa 360  
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Ser Thr Gly Ser Lys Gln Arg Ser Gln Asn Arg Ser Lys Thr Pro Lys  
 1 5 10 15

Asn Gln Glu Ala Leu Arg Met Ala Asn Val Ala Glu Asn Ser Ser Ser  
 20 25 30

Asp Gln Arg Gln Ala Cys Lys Lys His Glu Leu Tyr Val Ser Phe Arg  
 35 40 45

Asp Leu Gly Trp Gln Asp Trp Ile Ile Ala Pro Glu Gly Tyr Ala Ala  
 50 55 60

Tyr Tyr Cys Glu Gly Glu Cys Ala Phe Pro Leu Asn Ser Tyr Met Asn  
 65 70 75 80

Ala Thr Asn His Ala Ile Val Gln Thr Leu Val His Phe Ile Asn Pro  
 85 90 95

Glu Thr Val Pro Lys Pro Cys Cys Ala Pro Thr Gln Leu Asn Ala Ile  
 100 105 110

Ser Val Leu Tyr Phe Asp Asp Ser Ser Asn Val Ile Leu Lys Lys Tyr  
 115 120 125

Arg Asn Met Val Val Arg Ala Cys Gly Cys His  
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 gccaccaacc acgccatcgt gcagacgctg gtccacttca tcaacccgga aacggtgccc 300  
 aagccctgct gtgcgcccac gcagctcaat gccatctccg tcctctactt cgatgacagc 360  
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Ala Val Arg Pro Leu Arg Arg Arg Gln Pro Lys Lys Ser Asn Glu Leu  
1 5 10 15

Pro Gln Ala Asn Arg Leu Pro Gly Ile Phe Asp Asp Val His Gly Ser  
20 25 30

His Gly Arg Gln Val Cys Arg Arg His Glu Leu Tyr Val Ser Phe Gln  
35 40 45

Asp Leu Gly Trp Leu Asp Trp Val Ile Ala Pro Gln Gly Tyr Ser Ala  
50 55 60

Tyr Tyr Cys Glu Gly Glu Cys Ser Phe Pro Leu Asp Ser Cys Met Asn  
65 70 75 80

Ala Thr Asn His Ala Ile Leu Gln Ser Leu Val His Leu Met Lys Pro  
85 90 95

Asn Ala Val Pro Lys Ala Cys Cys Ala Pro Thr Lys Leu Ser Ala Thr  
100 105 110

Ser Val Leu Tyr Tyr Asp Ser Ser Asn Asn Val Ile Leu Arg Lys His  
115 120 125

Arg Asn Met Val Val Lys Ala Cys Gly Cys His  
130 135

<210> 12  
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cacgagctct acgtcagctt ccaggacctc ggctggctgg actgggtcat cgctcccaa 180  
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gccaccaacc acgccatcct gcagtccctg gtgcacctga tgaagccaaa cgcagtcccc 300  
aaggcgtgct gtgcaccac caagctgagc gccacctctg tgctctacta tgacagcagc 360  
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Ala Pro Leu Ala Thr Arg Gln Gly Lys Arg Pro Ser Lys Asn Leu Lys  
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Ala Arg Cys Ser Arg Lys Ala Leu His Val Asn Phe Lys Asp Met Gly  
20 25 30

Trp Asp Asp Trp Ile Ile Ala Pro Leu Glu Tyr Glu Ala Phe His Cys  
35 40 45

Glu Gly Leu Cys Glu Phe Pro Leu Arg Ser His Leu Glu Pro Thr Asn  
50 55 60

His Ala Val Ile Gln Thr Leu Met Asn Ser Met Asp Pro Glu Ser Thr  
65 70 75 80

Pro Pro Thr Cys Cys Val Pro Thr Arg Leu Ser Pro Ile Ser Ile Leu  
85 90 95

Phe Ile Asp Ser Ala Asn Asn Val Val Tyr Lys Gln Tyr Glu Asp Met  
100 105 110

Val Val Glu Ser Cys Gly Cys Arg  
115 120

<210> 14  
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<212> DNA



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&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; misc\_feature

&lt;222&gt; (1)..(363)

&lt;223&gt; GDF-5

&lt;400&gt; 14

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cttgagtacg aggctttcca ctgagagggg ctgtgcgagt tccattgcg ctcccacctg      180
gagcccacga atcatgcagt catccagacc ctgatgaact ccatggaccc cgagtccaca      240
ccacccacct gctgtgtgcc cagcgggctg agtcccatca gcacacctt cattgactct      300
gccacaacg  tgggtgataa gcagtatgag gacatggtcg tggagtcgtg tggctgcagg      360
tag                                                    363
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&lt;210&gt; 15

&lt;211&gt; 120

&lt;212&gt; PRT

&lt;213&gt; Mus musculus

&lt;220&gt;

&lt;221&gt; MISC\_FEATURE

&lt;222&gt; (1)..(120)

&lt;223&gt; GDF-6

&lt;400&gt; 15

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Thr Ala Phe Ala Ser Arg His Gly Lys Arg His Gly Lys Lys Ser Arg
1           5           10           15
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Leu Arg Cys Ser Arg Lys Pro Leu His Val Asn Phe Lys Glu Leu Gly
          20           25           30
```

```
Trp Asp Asp Trp Ile Ile Ala Pro Leu Glu Tyr Glu Ala Tyr His Cys
          35           40           45
```

```
Glu Gly Val Cys Asp Phe Pro Leu Arg Ser His Leu Glu Pro Thr Asn
50           55           60
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```
His Ala Ile Ile Gln Thr Leu Met Asn Ser Met Asp Pro Gly Ser Thr
65           70           75           80
```

```
Pro Pro Ser Cys Cys Val Pro Thr Lys Leu Thr Pro Ile Ser Ile Leu
          85           90           95
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```
Tyr Ile Asp Ala Gly Asn Asn Val Val Tyr Lys Gln Tyr Glu Asp Met
100          105          110
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Val Val Glu Ser Cys Gly Cys Arg  
 115 120

<210> 16  
 <211> 360  
 <212> DNA  
 <213> Mus musculus  
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 ctagagtaag aggcctatca ctgagagggc gtgtgcgact ttccgctgcg ctgcacactt 180  
 gagcccacta accatgccat cattcagacg ctgatgaact ccatggaccc gggctccacc 240  
 ccgcctagct gctgcgttcc caccaaaactg actcccatta gcacacctga catcgacgcg 300  
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 <213> Mus musculus

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<400> 17

Thr Ala Leu Ala Gly Thr Arg Gly Ala Gln Gly Ser Gly Gly Gly Gly  
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Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly  
 20 25 30

Ala Gly Arg Gly His Gly Arg Arg Gly Arg Ser Arg Cys Ser Arg Lys  
 35 40 45

Ser Leu His Val Asp Phe Lys Glu Leu Gly Trp Asp Asp Trp Ile Ile  
 50 55 60

Ala Pro Leu Asp Tyr Glu Ala Tyr His Cys Glu Gly Val Cys Asp Phe  
 65 70 75 80

Pro Leu Arg Ser His Leu Glu Pro Thr Asn His Ala Ile Ile Gln Thr  
                                     85                                    90                                    95

Leu Leu Asn Ser Met Ala Pro Asp Ala Ala Pro Ala Ser Cys Cys Val  
                                     100                                    105                                    110

Pro Ala Arg Leu Ser Pro Ile Ser Ile Leu Tyr Ile Asp Ala Ala Asn  
                                     115                                    120                                    125

Asn Val Val Tyr Lys Gln Tyr Glu Asp Met Val Val Glu Ala Cys Gly  
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Cys Arg  
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 atggcgcccc acgctgcgcc agcctcctgc tgcgtgcccg caaggctcag tcccatcagc 360  
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<400> 19

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Asn Ala Lys Gly Asn Tyr Cys Lys Arg Thr Pro Leu Tyr Ile Asp Phe  
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Lys Glu Ile Gly Trp Asp Ser Trp Ile Ile Ala Pro Pro Gly Tyr Glu  
20 25 30

Ala Tyr Glu Cys Arg Gly Val Cys Asn Tyr Pro Leu Ala Glu His Leu  
35 40 45

Thr Pro Thr Lys His Ala Ile Ile Gln Ala Leu Val His Leu Lys Asn  
50 55 60

Ser Gln Lys Ala Ser Lys Ala Cys Cys Val Pro Thr Lys Leu Glu Pro  
65 70 75 80

Ile Ser Ile Leu Tyr Leu Asp Lys Gly Val Val Thr Tyr Lys Phe Lys  
85 90 95

Tyr Glu Gly Met Ala Val Ser Glu Cys Gly Cys Arg  
100 105

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aactaccccc tggcagagca tctcacaccc acaaagcatg caattatcca ggccttggtc 180  
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&lt;400&gt; 21

Ser Ala Gly Ala Gly Ser His Cys Gln Lys Thr Ser Leu Arg Val Asn  
1 5 10 15

Phe Glu Asp Ile Gly Trp Asp Ser Trp Ile Ile Ala Pro Lys Glu Tyr  
20 25 30

Glu Ala Tyr Glu Cys Lys Gly Gly Cys Phe Phe Pro Leu Ala Asp Asp  
35 40 45

Val Thr Pro Thr Lys His Ala Ile Val Gln Thr Leu Val His Leu Lys  
50 55 60

Phe Pro Thr Lys Val Gly Lys Ala Cys Cys Val Pro Thr Lys Leu Ser  
65 70 75 80

Pro Ile Ser Val Leu Tyr Lys Asp Asp Met Gly Val Pro Thr Leu Lys  
85 90 95

Tyr His Tyr Glu Gly Met Ser Val Ala Glu Cys Gly Cys Arg  
100 105 110

&lt;210&gt; 22

&lt;211&gt; 333

&lt;212&gt; DNA

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&lt;220&gt;

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&lt;223&gt; GDF-2

&lt;400&gt; 22

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&lt;210&gt; 23

&lt;211&gt; 114

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; MISC\_FEATURE

&lt;222&gt; (1)..(114)

&lt;223&gt; BMP-2 mutein

&lt;400&gt; 23

Gln Ala Lys His Lys Gln Arg Lys Arg Leu Lys Ser Ser Cys Lys Arg  
1 5 10 15

His Pro Leu Tyr Val Asp Phe Ser Asp Val Gly Trp Asn Asp Trp Ile  
20 25 30

Val Ala Pro Pro Gly Tyr His Ala Phe Tyr Cys His Gly Glu Cys Pro  
35 40 45

Phe Pro Pro Ala Asp His Leu Asn Ser Thr Asn His Ala Ile Val Gln  
50 55 60

Thr Leu Val Asn Ser Val Asn Ser Lys Ile Pro Lys Ala Cys Cys Val  
65 70 75 80

Pro Thr Glu Leu Ser Ala Ile Ser Met Leu Tyr Leu Asp Glu Asn Glu  
85 90 95

Lys Val Val Leu Lys Asn Tyr Gln Asp Met Val Val Glu Gly Cys Gly  
100 105 110

Cys Arg

&lt;210&gt; 24

&lt;211&gt; 116

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; MISC\_FEATURE

&lt;222&gt; (1)..(116)

&lt;223&gt; BMP-4 mutein

&lt;400&gt; 24

Ser Pro Lys His His Ser Gln Arg Ala Arg Lys Lys Asn Lys Asn Cys  
1 5 10 15

Arg Arg His Ser Leu Tyr Val Asp Phe Ser Asp Val Gly Trp Asn Asp  
20 25 30

Trp Ile Val Ala Pro Pro Gly Tyr Gln Ala Phe Tyr Cys His Gly Asp  
35 40 45

Cys Pro Phe Pro Pro Ala Asp His Leu Asn Ser Thr Asn His Ala Ile  
 50 55 60

Val Gln Thr Leu Val Asn Ser Val Asn Ser Ser Ile Pro Lys Ala Cys  
 65 70 75 80

Cys Val Pro Thr Glu Leu Ser Ala Ile Ser Met Leu Tyr Leu Asp Glu  
 85 90 95

Tyr Asp Lys Val Val Leu Lys Asn Tyr Gln Glu Met Val Val Glu Gly  
 100 105 110

Cys Gly Cys Arg  
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Asn Gln Asn Arg Asn Lys Ser Ser Ser His Gln Asp Ser Ser Arg Met  
 1 5 10 15

Ser Ser Val Gly Asp Tyr Asn Thr Ser Glu Gln Lys Gln Ala Cys Lys  
 20 25 30

Lys His Glu Leu Tyr Val Ser Phe Arg Asp Leu Gly Trp Gln Asp Trp  
 35 40 45

Ile Ile Ala Pro Glu Gly Tyr Ala Ala Phe Tyr Cys Asp Gly Glu Cys  
 50 55 60

Ser Phe Pro Pro Asn Ala His Met Asn Ala Thr Asn His Ala Ile Val  
 65 70 75 80

Gln Thr Leu Val His Leu Met Phe Pro Asp His Val Pro Lys Pro Cys  
 85 90 95

Cys Ala Pro Thr Lys Leu Asn Ala Ile Ser Val Leu Tyr Phe Asp Asp  
 100 105 110

Ser Ser Asn Val Ile Leu Lys Lys Tyr Arg Asn Met Val Val Arg Ser  
 115 120 125

Cys Gly Cys His  
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Gln Gln Ser Arg Asn Arg Ser Thr Gln Ser Gln Asp Val Ala Arg Val  
1 5 10 15

Ser Ser Ala Ser Asp Tyr Asn Ser Ser Glu Leu Lys Thr Ala Cys Arg  
20 25 30

Lys His Glu Leu Tyr Val Ser Phe Gln Asp Leu Gly Trp Gln Asp Trp  
35 40 45

Ile Ile Ala Pro Lys Gly Tyr Ala Ala Asn Tyr Cys Asp Gly Glu Cys  
50 55 60

Ser Phe Pro Pro Asn Ala His Met Asn Ala Thr Asn His Ala Ile Val  
65 70 75 80

Gln Thr Leu Val His Leu Met Asn Pro Glu Tyr Val Pro Lys Pro Cys  
85 90 95

Cys Ala Pro Thr Lys Leu Asn Ala Ile Ser Val Leu Tyr Phe Asp Asp  
100 105 110

Asn Ser Asn Val Ile Leu Lys Lys Tyr Arg Asn Met Val Val Arg Ala  
115 120 125

Cys Gly Cys His  
130

<210> 27  
<211> 139  
<212> PRT  
<213> Homo sapiens

<220>  
<221> MISC\_FEATURE  
<222> (1)..(139)



<223> BMP-7 mutein

<400> 27

Ser Thr Gly Ser Lys Gln Arg Ser Gln Asn Arg Ser Lys Thr Pro Lys  
1 5 10 15

Asn Gln Glu Ala Leu Arg Met Ala Asn Val Ala Glu Asn Ser Ser Ser  
20 25 30

Asp Gln Arg Gln Ala Cys Lys Lys His Glu Leu Tyr Val Ser Phe Arg  
35 40 45

Asp Leu Gly Trp Gln Asp Trp Ile Ile Ala Pro Glu Gly Tyr Ala Ala  
50 55 60

Tyr Tyr Cys Glu Gly Glu Cys Ala Phe Pro Pro Asn Ser Tyr Met Asn  
65 70 75 80

Ala Thr Asn His Ala Ile Val Gln Thr Leu Val His Phe Ile Asn Pro  
85 90 95

Glu Thr Val Pro Lys Pro Cys Cys Ala Pro Thr Gln Leu Asn Ala Ile  
100 105 110

Ser Val Leu Tyr Phe Asp Asp Ser Ser Asn Val Ile Leu Lys Lys Tyr  
115 120 125

Arg Asn Met Val Val Arg Ala Cys Gly Cys His  
130 135

<210> 28

<211> 139

<212> PRT

<213> Homo sapiens

<220>

<221> MISC\_FEATURE

<222> (1) .. (139)

<223> BMP-8 mutein

<400> 28

Ala Val Arg Pro Leu Arg Arg Arg Gln Pro Lys Lys Ser Asn Glu Leu  
1 5 10 15

Pro Gln Ala Asn Arg Leu Pro Gly Ile Phe Asp Asp Val His Gly Ser  
20 25 30

His Gly Arg Gln Val Cys Arg Arg His Glu Leu Tyr Val Ser Phe Gln

35                                      40                                      45  
 Asp Leu Gly Trp Leu Asp Trp Val Ile Ala Pro Gln Gly Tyr Ser Ala  
     50                                      55                                      60  
 Tyr Tyr Cys Glu Gly Glu Cys Ser Phe Pro Pro Asp Ser Cys Met Asn  
     65                                      70                                      75                                      80  
 Ala Thr Asn His Ala Ile Leu Gln Ser Leu Val His Leu Met Lys Pro  
                                     85                                      90                                      95  
 Asn Ala Val Pro Lys Ala Cys Cys Ala Pro Thr Lys Leu Ser Ala Thr  
                                     100                                      105                                      110  
 Ser Val Leu Tyr Tyr Asp Ser Ser Asn Asn Val Ile Leu Arg Lys His  
                                     115                                      120                                      125  
 Arg Asn Met Val Val Lys Ala Cys Gly Cys His  
                                     130                                      135

<210> 29  
 <211> 120  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> MISC\_FEATURE  
 <222> (1)..(120)  
 <223> GDF-5 mutein

<400> 29

Ala Pro Leu Ala Thr Arg Gln Gly Lys Arg Pro Ser Lys Asn Leu Lys  
 1                                      5                                      10                                      15  
 Ala Arg Cys Ser Arg Lys Ala Leu His Val Asn Phe Lys Asp Met Gly  
                                     20                                      25                                      30  
 Trp Asp Asp Trp Ile Ile Ala Pro Leu Glu Tyr Glu Ala Phe His Cys  
                                     35                                      40                                      45  
 Glu Gly Leu Cys Glu Phe Pro Pro Arg Ser His Leu Glu Pro Thr Asn  
                                     50                                      55                                      60  
 His Ala Val Ile Gln Thr Leu Met Asn Ser Met Asp Pro Glu Ser Thr  
 65                                      70                                      75                                      80  
 Pro Pro Thr Cys Cys Val Pro Thr Arg Leu Ser Pro Ile Ser Ile Leu  
                                     85                                      90                                      95

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Phe Ile Asp Ser Ala Asn Asn Val Val Tyr Lys Gln Tyr Glu Asp Met  
100 105 110

Val Val Glu Ser Cys Gly Cys Arg  
115 120

<210> 30  
<211> 120  
<212> PRT  
<213> Mus musculus

<220>  
<221> MISC\_FEATURE  
<222> (1)..(120)  
<223> GDF-6 mutein

<400> 30

Thr Ala Phe Ala Ser Arg His Gly Lys Arg His Gly Lys Lys Ser Arg  
1 5 10 15

Leu Arg Cys Ser Arg Lys Pro Leu His Val Asn Phe Lys Glu Leu Gly  
20 25 30

Trp Asp Asp Trp Ile Ile Ala Pro Leu Glu Tyr Glu Ala Tyr His Cys  
35 40 45

Glu Gly Val Cys Asp Phe Pro Pro Arg Ser His Leu Glu Pro Thr Asn  
50 55 60

His Ala Ile Ile Gln Thr Leu Met Asn Ser Met Asp Pro Gly Ser Thr  
65 70 75 80

Pro Pro Ser Cys Cys Val Pro Thr Lys Leu Thr Pro Ile Ser Ile Leu  
85 90 95

Tyr Ile Asp Ala Gly Asn Asn Val Val Tyr Lys Gln Tyr Glu Asp Met  
100 105 110

Val Val Glu Ser Cys Gly Cys Arg  
115 120

<210> 31  
<211> 146  
<212> PRT  
<213> Mus musculus

<220>  
<221> MISC\_FEATURE  
<222> (1)..(146)  
<223> GDF-7 mutein

&lt;400&gt; 31

Thr Ala Leu Ala Gly Thr Arg Gly Ala Gln Gly Ser Gly Gly Gly Gly  
1 5 10 15

Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly  
20 25 30

Ala Gly Arg Gly His Gly Arg Arg Gly Arg Ser Arg Cys Ser Arg Lys  
35 40 45

Ser Leu His Val Asp Phe Lys Glu Leu Gly Trp Asp Asp Trp Ile Ile  
50 55 60

Ala Pro Leu Asp Tyr Glu Ala Tyr His Cys Glu Gly Val Cys Asp Phe  
65 70 75 80

Pro Pro Arg Ser His Leu Glu Pro Thr Asn His Ala Ile Ile Gln Thr  
85 90 95

Leu Leu Asn Ser Met Ala Pro Asp Ala Ala Pro Ala Ser Cys Cys Val  
100 105 110

Pro Ala Arg Leu Ser Pro Ile Ser Ile Leu Tyr Ile Asp Ala Ala Asn  
115 120 125

Asn Val Val Tyr Lys Gln Tyr Glu Asp Met Val Val Glu Ala Cys Gly  
130 135 140

Cys Arg  
145

&lt;210&gt; 32

&lt;211&gt; 108

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; MISC\_FEATURE

&lt;222&gt; (1)..(108)

&lt;223&gt; BMP-10 mutein

&lt;400&gt; 32

Asn Ala Lys Gly Asn Tyr Cys Lys Arg Thr Pro Leu Tyr Ile Asp Phe  
1 5 10 15

Lys Glu Ile Gly Trp Asp Ser Trp Ile Ile Ala Pro Pro Gly Tyr Glu  
20 25 30

Ala Tyr Glu Cys Arg Gly Val Cys Asn Tyr Pro Pro Ala Glu His Leu  
35 40 45

Thr Pro Thr Lys His Ala Ile Ile Gln Ala Leu Val His Leu Lys Asn  
50 55 60

Ser Gln Lys Ala Ser Lys Ala Cys Cys Val Pro Thr Lys Leu Glu Pro  
65 70 75 80

Ile Ser Ile Leu Tyr Leu Asp Lys Gly Val Val Thr Tyr Lys Phe Lys  
85 90 95

Tyr Glu Gly Met Ala Val Ser Glu Cys Gly Cys Arg  
100 105

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<210> 33
<211> 110
<212> PRT
<213> Homo sapiens
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<220>
<221> MISC_FEATURE
<222> (1) .. (110)
<223> GDF-2 mutein
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<400> 33

Ser Ala Gly Ala Gly Ser His Cys Gln Lys Thr Ser Leu Arg Val Asn  
1 5 10 15

Phe Glu Asp Ile Gly Trp Asp Ser Trp Ile Ile Ala Pro Lys Glu Tyr  
20 25 30

Glu Ala Tyr Glu Cys Lys Gly Gly Cys Phe Phe Pro Pro Ala Asp Asp  
35 40 45

Val Thr Pro Thr Lys His Ala Ile Val Gln Thr Leu Val His Leu Lys  
50 55 60

Phe Pro Thr Lys Val Gly Lys Ala Cys Cys Val Pro Thr Lys Leu Ser  
65 70 75 80

Pro Ile Ser Val Leu Tyr Lys Asp Asp Met Gly Val Pro Thr Leu Lys  
85 90 95

Tyr His Tyr Glu Gly Met Ser Val Ala Glu Cys Gly Cys Arg  
100 105 110